pupae, emerged May 22, 1921. The larvae were collected along the margin of a stream near Hempstead, Long Island, N. Y., during the latter part of April.

ON THE GENUS MICROVELIA WESTWOOD (HEMIPTERA, VELIIDAE).

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A thorough monographic treatment of the American species of *Microvelia* is a great desideratum, but this can hardly be accomplished until the type specimens of Champion and Uhler are carefully examined and the wingless phases of several species made known. In fact, the complete elucidation of *marginata* Uhler, *robusta* Uhler, and *albonotata* Champion will probably involve the study of further collections from Central America and the West Indies. Thus in connection with notes on two recently described species, I think that it will be useful to offer some observations on the genus, including a descriptive synopsis based largely on new characters, by which most of the species reported from the Eastern States may be readily distinguished in the apterous condition. The macropterous forms, relatively very rare, may, as a rule, be easily associated with their apterous phases by correspondence in size and in antennal and genitalic characteristics.

The structure of the thorax in the Gerridae and Veliidae is curiously and diversely modified, and there is here an opportunity for an extensive and thorough morphological investigation, although Bergroth, Kirkaldy, and others have published something on the subject. In Microvelia the apterous thorax is very peculiar and has been much misunderstood. The pronotum is relatively long on the median line and bears either a distinct transverse linear impression (*americana* and *borealis*) or one or two rows of punctures. The mesonotum is much shorter than the pronotum when visible, or it may be entirely concealed beneath

the pronotum. In his paper on the European species of Microvelia (Note sur les deux Microvelia d'Europe. Ann. Mus. Nat. Hungarici, XIV: 68–71, 1916, 2 figs.) Horváth makes use of these modifications in the mesonotal structure to distinguish the two species, and both conditions are illustrated by American forms, for in *fontinalis* (fig. 3) the mesonotum is concealed as in *pygmaea* (Dufour) Horv., while the rest of the species noticed below, with one exception, have the other type of structure, like

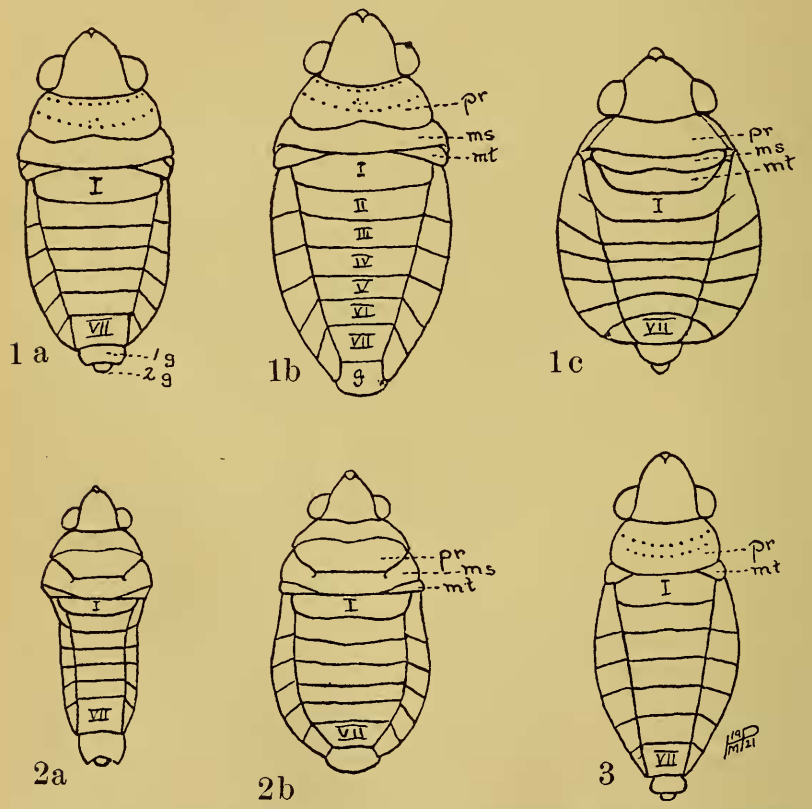

FIG. 1. *Microvelia hinei* Drake.—*a,* male; *b,* female; *c,* nymph. (x 40.) FIG. 2. *M. borealis*—*a,* male; *b,* female. (x 20.) FIG. 3. *M. fontinalis*—male. (x 17.) I–VII, dorsal abdominal segments; *pr,* pronotum; *ms,* mesonotum; *mt,* metanotum, metanotal triangles; *g,* genital segment.

reticulata (Burmeister) Horv. (cf. fig. 1a). The metanotum is always concealed at middle, appearing on each side as a small triangular area, which I propose to term the metanotal triangle. These triangles are widely different in shape in the different species, as the figures show, and thus they furnish taxonomic characters of great value. In the nymph (fig. 1c) the metanotum is not concealed at middle. The segment immediately following, which has often been treated as the metanotum, is in reality the first dorsal segment of the abdomen, which thus has seven segments, exclusive of the genital segments.

M. atrata is peculiar in having minute vestigial wings, and the pronotum is correspondingly enlarged, approaching somewhat the condition characteristic of the winged forms. It is produced posteriorly, so that it covers not only both mesonotum and metanotum, but also the median portion of the first abdominal segment.

The structure of the tarsi has likewise been variously interpreted. In all the American and exotic species which I have been able to examine there is agreement in the number of tarsal segments in the adult stage; all have the front tarsi with one segment, the middle and hind with two, or, as it is briefly expressed, the tarsal formula is 1:2:2. I do not think that the minute enlargement or "node" which may be perceived (with difficulty) at the base of the first tarsal segment can be considered as a true segment, because this node appears to be nothing more than a slight basal swelling of the metatarsus when the leg is cleared and examined under very high magnification. When it is counted, as by Champion in the "Biologia," the tarsal formula becomes 2:3:3, and the species remain uniform in this particular. The subgenus *Kirkaldya* Torre-Bueno was founded on the supposition that *americana* differed in tarsal formula from the other species, and since there are no other characters to support it, it must be definitely suppressed. Van Duzee in his Catalogue of 1917 maintains this subgenus, although de la Torre-Bueno, in his later paper on the Veliinae of the Atlantic States (Bull. Brooklyn Ent. Soc., XI: 52–61, 1916), makes no mention of it; however, in the table of species there given the tarsi are still made to vary, and

therefore the matter must be called to the attention of students.

The rather numerous species of Microvelia, long neglected on account of their minute size and the deceptively immature appearance of the apterous adults, are now being rapidly made known, and it is becoming clear that they all have a wide distribution, at least in the region east of the Mississippi River. During June of the present year I met with two species recently described by Drake, *M. buenoi* (An undescribed water-strider from the Adirondacks. Bull. Brooklyn Ent. Soc., XV: 19–21, 1920) and *M. hinei* (Water-striders new to Ohio. Ohio Jour. Sci., XX: 207, 1920), living in company with *M. albonotata* on a small campus pond at Northampton, Massachusetts. These appeared only in the apterous form, but I have since taken both apterous and winged phases of *hinei* at Cold Spring Harbor, Long Island, N. Y. The species last mentioned is remarkable for its beautiful coloration and extremely small size; in fact, I think it is the smallest known Microvelia. The following descriptive notes are presented to supplement the original description.

Microvelia hinei Drake. Fig. 1.

Wingless form.—Second, third, and fourth abdominal segments with narrow median yellow stripe, bluish laterally; fifth black, with median stripe; sixth and seventh bluish or yellowish, the median line narrowly black or brown, polished. In the darkest specimens the dorsal markings become very obscure.

Median impressed line of head not glabrous; antennae longer than head and thorax together on median line. (27–25); first segment (7) stout, second (5) almost as thick as first, clavate, third (8) half as thick as second, almost linear, fourth (12) somewhat thicker than third, very slenderly fusiform, slightly shorter than distance between eyes (12–13); rostrum extending to front coxae. Thorax short, nearly three times as wide as long on median dorsal line; pronotum four times as wide as long, with a transverse curved row of punctures near anterior margin and one behind middle. Mesonotum visible, more than one-half as long as pronotum on median line, posterior margin nearly straight across middle. Metanotal triangles each about one-third as long as width of mesonotum. First and second abdominal segments about equal in length, third to sixth about equal, each slightly shorter than second, seventh longest, but shorter than broad.

Connexivum rather broad, often strongly reflexed. Legs rather short and stout, the posterior femora barely reaching genital segment.

Male (fig. 1*a*).—General form oblong oval (when connexivum is not much reflexed); lateral margins of connexivum straight in anterior half; seventh abdominal segment almost rectangular, distinctly emarginate posteriorly; second genital small, hemispherical, half as long as first (as seen from above). Length 1–1.3 mm.

Female (fig. 1*b*).—General form oval, slightly broader than male; connexivum rarely reflexed, its lateral margin evenly curved; seventh abdominal segment trapezoidal, its anterior margin longer than the posterior (10–6); dorsal genital segment transverse, rectangular, shorter than the preceding. Color pattern usually more brightly developed than in the male. Length 1.3–1.6 mm.

In antennal structure this species is somewhat similar to *buenoi* Drake, but otherwise it is not closely related to any of the described species. Aside from size and coloration, it is peculiar in its thoracic structure, lack of striking sexual dimorphism (cf. figs. 1 and 2), and genital characteristics. The winged specimens found on Long Island agree perfectly with Drake's description. At Northampton the nymphs of the apterous form were numerous, apparently in the last instar.

Nymph (fig. 1*c*).—Velvety brown, brightly marked with yellow. Head with two broad, longitudinal, dull yellow stripes; median line of thorax and abdomen yellow, broadest on first abdominal segment; mesothorax, lateral portions of metathorax, lateral margins of whole thorax, and connexivum anteriorly, yellow; connexivum brown posteriorly, with yellow spots inwardly; sixth and seventh abdominal segments pale.

Antennae stouter than in adult; the first, second, and fourth segments equally thick; the third more slender and nearly cylindrical; proportions—6: 3: 5: 10. Pronotum very broad (27–6), nearly straight posteriorly across middle, the disc with a faint postmedian row of punctures. Mesonotum very short, its posterior margin strongly sinuate. Metanotum somewhat longer than preceding segment, fully exposed across middle, its posterior margin nearly straight, curved forward laterally. First abdominal

segment large, much longer than second, about as long as seventh. Connexivum very broad, only slightly reflexed, continuous anteriorly with the distinctly margined sides of thorax, which extend to eyes. Form broadly oval. Genital segments prominent. Length about 1.2 mm.

The interpretation of the thoracic structure given above was arrived at by careful comparison with the adult anatomy, and I think it is correct; but the matter will bear further investigation and the attention of students is invited to it.

Table of Apterous Forms.

This key includes all the species recorded from the eastern part of North America, excepting *marginata* Uhler and *robusta* Uhler, which were described from the West Indies and may not in reality occur on the continent; moreover, I believe that their wingless forms have not been made known. The color characters given are general, not detailed, and pertain chiefly to the dorsal aspect. The first form noticed in the key is not strictly apterous, as it possesses very minute vestigial wings, but it is included here since the species appears also in the fully winged condition.

1. Pronotum largely developed, strongly arcuate and produced posteriorly, reaching base of second abdominal segment; minute white wing-pads present, projecting from under pronotum at lateral angles; first abdominal segment visible only at sides; color velvety brown, pronotum anteriorly with a transverse yellow mark, connexivum dull yellow exteriorly; length about 1.7 mm..... *atrata* Torre-Bueno.

   Pronotum reduced, not much produced posteriorly, reaching at most to base of first abdominal segment; wings entirely absent; first abdominal segment fully exposed.....2.

2. Mesonotum concealed by pronotum; metanotal triangles almost obtuse, extending inwardly much less than one-third the width of the body at their level (fig. 3); entire thorax on median line less than twice as long as first abdominal segment; body strongly pilose; color dark brown, the anterior portion of pronotum, first abdominal segment, and connexivum variably pale; abdomen marked at base and apex with patches of fine bluish gray pubescence, variably conspicuous; length about 2.3 mm.... *fontinalis* Torre-Bueno.

   Mesonotum visible; metanotal triangles very acute, longer (cf.

fig. 1*a*); thorax longer as compared with first abdominal segment .....3.

3. Pronotum with a distinct transverse linear impression before middle (cf. fig. 2*a*).....4.
   Pronotum without the linear impression, often with one or two transverse rows of punctures (cf. fig. 1*a*).....5.
4. Abdomen ornamented dorsally with conspicuous patches of silvery pubescence; hind tibiae similar in male and female; color dark brown, a transverse mark on anterior lobe of pronotum and a spot on each connexival segment dull yellowish; length about 2.3 mm.....*americana* Uhler.
   Abdomen without silvery pubescence; hind tibiae bent in male; color black or brown with grayish markings more distinct in female than in male; length about 1.8 mm. (fig. 2). *borealis* Torre-Bueno.
5. Length about 2.3 mm.; surface shining, very minutely pubescent; antennae very long and slender, the fourth segment twice as long as distance between eyes; color yellowish brown, variably marked with black..*albonotata* Champion.
   Length less than 2 mm.; pubescence more strongly developed, though short, surface dull; fourth antennal segment about as long as distance between eyes.....6.
6. Pronotum about three times as long on median line as mesonotum; abdomen with conspicuous tufts of silvery pubescence; third antennal segment slenderly clavate, slightly longer than second (6–5); color black, anterior lobe of pronotum yellowish, abdomen with dull grayish patches; length about 1.7 mm.....*buenoi* Drake.
   Pronotum not twice as long as mesonotum; abdomen without silvery pubescence; third antennal segment almost linear, much longer than second (8–5); color light to dark brown, with black, yellow, and bluish markings; length 1–1.6 mm. .....*hinei* Drake.

THE NUMBER OF ANTENNAL SEGMENTS IN GALL MIDGES AND A NEW SPECIES.

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The normal number of antennal segments among generalized Nematocera is probably 16—that is, a greater or a smaller number means specialization by addition or reduction. The remark-